What Drives Online Grocery Shopping?

Chinonso Etumnu, cetumnu@purdue.edu
Nicole Olynk Widmar, nwidmar@purdue.edu
Kenneth Foster, kfoster@purdue.edu
Department of Agricultural Economics, Purdue University

David Ortega, dlortega@msu.edu
Department of Agricultural, Food and Resource Economics, Michigan State University

Selected Paper prepared for presentation at the 2019 Agricultural & Applied Economics Association Annual Meeting, Atlanta, GA, July 21 – July 23

Abstract

Online grocery markets in the United States are projected to be worth $100 billion in 2022 and leading food retailers in the country are flocking to this marketplace. From consumers' perspective, what is driving the growth in online grocery shopping? To address this question, we first hypothesize that online grocery shopping is related, at least in part, to consumer demographics and perceptions of grocery shopping, and then we test these broad hypotheses in a logistic analysis. Using data from 985 consumers that are representative of the demographics of the United States population, we find that consumer's age, online shopping experience and taking children to grocery shopping are key drivers of online grocery shopping. In addition, consumer's perception of convenience, relative prices, service quality and food safety are important drivers as well. These results may be of interest to retailers and policymakers who are involved in decisions related to online grocery shopping.

1 Introduction

What drives online grocery shopping in the United States? Is it convenience, time saving, relative prices or perhaps even perceptions of food safety? Furthermore, how are these motivations for online grocery shopping related to household and individual demographic factors, such as having children in the household, overall household income, age and location of shoppers? As consumers are the fulcrum of retail transactions, it is pertinent to learn how the demographics and perceptions of online grocery shoppers differ from those of the general population because understanding online grocery shopping behaviors will have important implications for the still-developing online grocery retail sector in the United States and around the world.

Online grocery markets in the United States are projected by the Food Marketing Institute to be worth $100 billion in 2022 (Nielsen, 2015), and leading food retailers in the country are flocking to this marketplace. For example, Amazon, Walmart, Target and Safeway have recently made bold moves in the online grocery market space, joining their competitors to offer various services that will expand their market share, entice new consumers while maintaining consumer loyalty. Walmart owned Sam's Club teamed up with Instacart for same-day grocery delivery (Perez, 2018); Target recently acquired Instacart's rival Shipt for $550 million (Boyle, 2017); and Amazon acquired Whole Foods and rolled out two-hour same day delivery to its prime members in a few cities (Redman, 2018). However, making substantial investments in online grocery markets without a deep understanding of the reasons behind consumer decisions may hinder success. Given that the demise of online grocery retailers in the past was partly linked to misunderstanding of consumer behavior (Kornum and Bjerre, 2005), the need to better understand consumers becomes even more pertinent to the business models of the current e-grocers.

This paper examines the drivers of online grocery shopping. Specifically, this study explores linkages between consumer demographics and perceptions, and their previous online grocery shopping behavior. This investigation is important for at least two reasons: First, because of the projected growth in online grocery shopping in the United States, it is valuable to know the socio-demographics of those consumers who currently shop online for groceries and those who may shop online for groceries in the future. This information will help retailers improve marketing efforts to expand their online grocery market shares. Policy makers may have an interest in following these trends as, for example, they could impact sales tax revenues and/or their sources. Second, consumers perceptions of the food shopping experience, or possibly the food items obtained, may also affect the propensity to shop online (or not) for groceries. However, it remains unclear which types of consumer perceptions may be related to their online grocery shopping behavior. Knowing the perceptions of online grocery shoppers relative to those who do not shop online will facilitate decision making by grocery retailers and policymakers to tailor their investments and policies.

Since the 1980s, economists have paid attention to household's grocery shopping decisions in the United States (Doti and Sharir, 1981; Carlson and Gieseke, 1983; Blaylock and Smallwood, 1987; Blaylock, 1989; Kolodinsky, 1990). For example, using two-stage least squares estimation method, Doti and Sharir (1981) find that the amount of time spent on grocery shopping in a store is reduced by the number of hours of work and the presence of children in the household, and increased by grocery expenditures. Carlson and Gieseke (1983) also use two-stage least squares to explain that the number of store visits results in getting lower prices for groceries. In addition, they find that the number of grocery store visits is positively associated with grocery expenditures, age, income and education. In many households, the choice of who makes grocery purchase decisions

are based on the efficiency of the shopper, that is the shopper's ability to get lower prices, and the relative value of their time (Blaylock and Smallwood, 1987). Other research areas such as grocery shopping frequency (Blaylock, 1989), enjoyment of time spent grocery shopping (Kolodinsky, 1990), and between country comparison of grocery shopping time (Kolodinsky and LaBrecque, 1996) have been explored. In a more recent work, Cai (2010) uses data from the America Time Use Survey to examine the determinants of grocery shopping time relative to other shopping activities. Interestingly, Cai (2010) finds that the effects of economic and demographic characteristics on grocery shopping time differ from non-grocery shopping time, which supports the notion that grocery shopping should be treated separately in the analysis of intra-household time allocation. Although the above studies provide interesting insights about the household's and individual's decision to shop for groceries, there is still much to learn about what drives consumers to shop for groceries online, which is the focus of this study.

2 Methodology

To understand what drives consumers to shop online for groceries, we test two broad hypotheses. First, we hypothesize that specific socio-demographics such as having children in the household, age and previous online shopping experience affect the propensity to shop for groceries online. Second, we hypothesize that consumers who shop online for groceries have favorable perceptions about online grocery shopping relative to in-store grocery shopping in terms of convenience, grocery prices, food safety and service quality.

We model consumer choices of either to shop online or in-store using a binary logit model (Train, 2009). We specify that the consumer has two main outlets for purchasing groceries, and their choice of these alternatives can be predicted using their demographics and their perceptions.

This approach allows us to understand which demographics and perceptions are related to the choice of the grocery shopping channel.

Given that many consumers may shop for groceries both from the online and in-store channels, we constructed the binary outcome from the following survey question: Which of the following best describes your use of online grocery services? (1) I do none of my grocery shopping online (2) I do a small amount of my grocery shopping online (e.g. less than one-quarter) (2) I do some of my grocery shopping online (e.g. between a quarter and a half) (3) I do most of my grocery shopping online (e.g. between a half and three-quarter) (4) I do almost all my grocery shopping online (e.g between three-quarter and all of it) (5) I do all of my grocery shopping online. To obtain the binary shopping channel outcome, we categorized respondents that chose options 2-6 as those that have previously shopped groceries online and respondents that selected 1 as those that have not previously shopped groceries online. We coded the responses as 1—online and 0—in-store.

The indirect utility of choosing to shop online or in-store (j) by consumer i is given by

$$U_{ij} = \boldsymbol{X}_i\boldsymbol{\beta} + \boldsymbol{Z}_i\boldsymbol{\alpha} + \varepsilon_{ij} \quad (1)$$

where the matrices $\boldsymbol{X}_i$ and $\boldsymbol{Z}_i$ contains the demographics and perceptions of the consumer i, and $\boldsymbol{\beta}$ and $\boldsymbol{\alpha}$ are the coefficients of the matrices, respectively. The error term (ε_{ij}) captures the unobserved drivers of online relative to in-store grocery shopping that are observed by the consumer, but not the researcher. Our distribution assumptions about $\boldsymbol{\beta}$, $\boldsymbol{\alpha}$ and ε_{ij} determine the type of discrete choice model that we use. Assuming that there are no consumer heterogeneity with respect to the demographics and perceptions, as well as that ε_{ij} are independently and identically distributed extreme value (type 1), then we have a logit model. Given the logit model, the probability that the online grocery store is chosen, that is $U_{ij} > U_{ik}$, is therefore

$$\Pr(j = 1) = \frac{e^{(\boldsymbol{X}_i\boldsymbol{\beta}+\boldsymbol{Z}_i\boldsymbol{\alpha}+\varepsilon_{ij})}}{1 + e^{(\boldsymbol{X}_i\boldsymbol{\beta}+\boldsymbol{Z}_i\boldsymbol{\alpha}+\varepsilon_{ik})}}.$$

We estimated the logit model using data from an online survey that was conducted in April 2019. The survey was designed and distributed using Qualtrics while respondents came from an opt-in panel from Kantar, a consumer research company. The survey targeted a representative sample of the United States population in terms of gender, age, region and education by employing quotas within Qualtrics set to target proportions from the United States Census Bureau. The survey collected information on consumer demographics and their online shopping behavior as well as consumer perceptions of online relative to in-store grocery shopping. Information about consumer perceptions were elicited on three levels of agreement—agree, neither agree nor disagree, and disagree—using statements about how expensive, convenient, timesaving, etc. online grocery shopping is relative to in-store grocery shopping.

Incorporating information on consumer socio-demographics and perceptions into the choice model lead to the following empirical model:

$$\begin{aligned} U_{ij} = {} & Income_i + Children_i + Region_i + Urban_i + Age_i + Education_i + Gender_i \\ & + Experience_i + Expensive_i + Timesaving_i + Convenient_i + Foodsafety_i \\ & + Foodvariety_i + Searchcost_i + Servicequality_i + Brand_i + \varepsilon_{ij} \end{aligned}$$

where U_{ij} is 1 if the consumer previously shopped online for groceries and 0 otherwise. $Income_i$ is a categorical variable that indicates the household's monthly income, $Children_i$ a dummy variable that indicates whether the consumer takes children to the grocery store, and $Region_i$ is the regional location of the household in the United States. The regions include Northeast, Midwest, South and West. $Urban_i$ is a categorical variable showing whether the consumer lives in an urban, suburban or rural location. Age_i is a categorical variable that indicates the age of the

shopper. $Education_i$ is a categorical variable that indicates the educational level of the shopper. $Gender_i$ is a dummy variable that indicates the gender of the shopper. $Experience_i$ is dummy variable that indicates whether the consumer has access to Amazon Prime subscription. The other variables are consumer's perception of how expensive ($Expensive_i$), time saving ($Timesaving_i$), and convenient ($Convenient_i$) online grocery markets are relative to in-store grocery markets. Other consumer perception variables between online grocery markets and in-store grocery markets include food safety ($Foodsafety_i$), food variety ($Foodvariety_i$), search cost ($Searchcost_i$), service quality ($Servicequality_i$) and brand ($Brand_i$). Recall that all these perception variables are categorical indicating whether the consumers agree, disagree, or neither agree nor disagree with perception statements.

Estimation and identification concerns arise from our model and data, which deserves upfront discussion. First, similar to several studies that rely on non-random observational data, there is potential endogeneity; thus, we cannot interpret our estimates as causal predictors of online grocery shopping. Respondents who stated that they shopped online for groceries and those who did not self-selected themselves into each group; they were not randomly assigned. Our estimates should thus be interpreted only as associations between consumer perceptions and their demographics, and their previous online grocery shopping behavior. Second, although we believe that we have a rich set of explanatory variables that capture what drives online grocery shopping, we cannot confirm whether there are important drivers still left out, which are known solely by the respondents. Factors other than consumer demographics and perceptions can drive consumers to shop online for groceries. For example, the characteristics of the products and online retailers under consideration may drive consumers to shop for groceries online. Consumers may prefer to have bulky grocery items such as water to be delivered to their homes while other consumers may prefer

to see and touch some grocery products before purchasing them. Similarly, the ease of using the online platform of a retailer may make consumers buy groceries online. However, our analysis neither considers the characteristics of the individually purchased products nor the retailers.

Despite these drawbacks, we believe that our effort is a worthwhile attempt to understand what drives online grocery shopping. Since we cannot randomly assign respondents to either shopping online or in-store, do not have data on the characteristics of the products and the retailers, and do not have access to panel data with possible exogenous variations from grocery retailers, we rely on self-reported data to understand how consumer demographics and perceptions may be associated with online grocery shopping behavior.

3 Results and Discussion

Demographics

The demographic profiles of all the respondents, and the online and in-store grocery shoppers are provided in Table 1. In the second column, which represents all the respondents, we can see that the majority of respondents are female (55 percent), older than 44 years (57 percent), has some college education (70 percent) and earn at least $50,000 (52 percent). Relative to the urban and rural areas, most of the respondents live in suburban areas (50 percent), are actively involved in online shopping (52 percent) and do not have or take children to grocery shopping (74 percent). The percentage of males in the census is 49 percent, while it is 45 percent in the survey, and the percentage of respondents aged 65+ years is 21 percent in the survey and 19 percent in the census. The percentage of respondents who earn $100,000+ is 23 percent in the survey, but 26 percent in the census, and the percentage of respondents who have a graduate or professional degree is 12 percent in the census while it is 14 percent in the survey. The proportion of respondents who lived

in the West is 24 percent and 21 percent in the census and survey, respectively. Similar comparable results between the census and the survey were obtained for other demographics as reported in Table 1.

Columns 2 and 3 of Table 1 disaggregate the overall sample into those consumers who said that they previously shopped groceries online and those consumers who indicate that they have not previously shopped online for groceries. In general, 31 percent of the respondents said that they have previously shopped online for groceries. In terms of gender, more men compared to women (35 percent vs. 28 percent) said they have previously shopped online for groceries. This result differs significantly from those of Morganosky and Cude (2000), who report that only 18 percent of men shopped groceries online in their sample. However, note that their survey was conducted in 1998. Therefore, there has been a lot of evolution in gender roles in many parts of the world in the past 20 years, in addition to evolutions of technology allowing greater ease of online shopping from mobile devices, etc.

Concerning age, the percentage of respondents who said they have previously shopped for groceries online decreases with age, as expected. For example, 55 percent of the respondents aged 18-24 years had shopped groceries online compared to 41 percent of those aged 35-44 years and 18 percent of those aged 55-64 years. These results are similar to those of Morganosky and Cude (2000), who find that only 9 percent of the respondents aged 55 years or older had previously shopped groceries online. With respect to income, there seem not to be stacked differences in patterns among online shoppers in different income categories. However, when it comes to educational level, the percentage of respondents who had associates or bachelor's degrees and those who had graduate or professional degrees that previously shopped online are 33 percent and

39 percent, respectively. These numbers are slightly higher than the number of online grocery shoppers in the overall sample (31 percent).

Other demographic variables that showed patterns across categories are location, experience, and taking children grocery shopping. Compared to the suburban (26 percent) and rural (29 percent) populations, respondents who live in urban areas have a higher percentage of online grocery shoppers (44 percent). A high proportion of respondents (45 percent) who are experienced online shoppers (have access to Amazon Prime subscription), have also previously shopped online. Of the overall survey respondents, 55 percent of those who take children to grocery shopping reported previous online grocery shopping.

Perceptions

Table 2 reports the perception of consumers regarding online vs. in-store grocery shopping, again disaggregating the data by whether the respondents have previously shopped online for groceries. In looking at the second column, which splits into three smaller columns of agree, neither agree nor disagree, and disagree, we can see the proportion of respondents in each category with respect with the perception statement. For example, 37 percent of the respondents agree that groceries are more expensive online than in-store, compared to 13 percent of the respondents who disagree with the statement. We also find that the same proportion of respondents (30 percent) agree and disagree to the statement about how convenient online grocery shopping is relative to in-store grocery shopping. Other major findings include the different levels of agreement regarding food safety. A high proportion of respondents (41 percent) agree that they more concerned about food safety in online relative to in-store.

The second column of Table 2 disaggregates these responses based on whether the respondents have previously shopped groceries online. Among respondents who disagree with the statement that groceries are more expensive online than in-store, 41 percent had shopped online for groceries. The proportion of respondents who agree that shopping for groceries online is more convenient and timesaving than in-store and had shopped groceries online are 60 percent and 53 percent, respectively. Correspondingly, the proportion of respondents who have previously shopped online for groceries and agree to the statement about easier product search, price comparison and service quality are 56 percent, 52 percent and 70 percent. In general, these perception results indicate that respondents who showed favorable perceptions towards online relative to in-store grocery shopping are more likely to have previously shopped online for groceries.

Logit Estimates

Table 3 reports results of the logistic analysis. All the demographic and perception variables that we previously discussed and presented in Tables 1 and 2 are included in this logit regression specification. The second column reports the coefficients and standard errors (in bracket) and the third column contains the post-estimation margins, which are the probability of shopping online relative to in-store for each variable.

For age, we chose the base category as the age group 65+ and the accompanying results are relative to this age group. The odds of shopping for groceries online decreased from 4.37 to 2.10 times for the 18-24 and 45-54 age groups. Similarly, the probability of shopping online for groceries decreases from 0.43 for the 18-24 age group to 0.32 for the 45-54 age group. All the age groups are statistically significant, except for the 55-64 years age group. These results corroborate

the findings of Perea et al. (2004). Perea et al (2004) observe that younger people, especially those below 25 are more exploratory with the Internet and new technologies in general. In addition, they note that younger people are more responsive to the features of e-commerce in general than older people, which drives their online shopping behavior. Ratchford et al (2001) suggest that older people are deterred by the cost of investing in the Internet and learning new skills needed to effectively shop online.

In addition to age, the odds of shopping for groceries online for males is 1.43 times the odds of shopping for groceries online for females. The probability for shopping online for groceries for men is 0.34. However, this result is only slightly significant at the 10 percent level. Gender might affect grocery shopping efficiency because of wage disparity and social norms that persist today. Women increasingly participate in the labor force and, in many cases, women earn higher wages than men (Wang et al., 2013). Many men are also taking up more household responsibilities and it is no longer uncommon to see the merging or reversal of traditionally expected gender roles within a household. Thus, this result is not as surprising as it would have been historically. Indeed, Burke (2002) finds that men show great interest in the Internet, which may lead to an increase in the use of online grocery shopping services.

In terms of educational level, relative to the education category of less than high school, respondents with associate/bachelor's degrees as well as those with graduate/professional degrees are more likely to shop for groceries online than in-store, with odds that are 3.84 and 4.19 times larger. These numbers transform to probabilities of 0.36 and 0.37 for the likelihood to shop online for groceries foe these educational categories. Burke (2002) and Perea et al (2004) find that consumers with higher education are more likely to shop online. Consumers with higher education generally have higher income and greater opportunity cost for their time, which may drive their

decision to shop online for groceries. This is also in line with the observation of Li et al. (1999), who find that the use of the Internet is positively correlated with higher education. Other demographic variables that significantly drive whether a consumer previously shopped online for groceries are location, experience with online shopping and taking children to grocery shopping.

The odds of shopping for groceries online for those who live in urban areas is 1.71 times the odds for those who live in suburban areas. In addition, the probability of shopping for groceries online for urban and rural dwellers are 0.36 and 0.31. Because online grocery markets have not reached some suburban areas for many produce and perishable products, this online shopping model is more likely to be adopted by city dwellers more than suburban and rural dwellers. The odds for online grocery shopping for those who actively shops online (have access to Amazon Prime subscription) is 2.40 times the odds for those who do not have access to Amazon Prime subscription. Previous online shopping experience increases the likelihood of consumers to shop for groceries online (Perea et al 2004). It seems reasonable that consumers who are already actively involved in shopping for other products online will have less of a problem to include groceries in their product basket relative to consumers who do not actively shop online. Furthermore, the odds of shopping for groceries online for a consumer who takes children to the grocery shopping is 2.31 times more than a consumer who do not have a child or take children grocery shopping. The increase may be because having children in the grocery store makes it more inconvenient to shop for groceries, especially when the number of children outnumbers that of parents.

Aside from these consumer demographics, consumer perceptions of convenience, relative prices, service quality and food safety stand out as important drivers of consumers' decision to shop for groceries online. For all the perception variables, the base category is "neither agree nor disagree". Consumers who agree with the statement that online grocery shopping is more

convenient than in-store grocery shopping are more likely to shop online than in-store. The odds of shopping for groceries online is 2.07 times more for those who agree, and the probability for shopping online for groceries for them is 0.39. Morganosky and Cude (2000) find that over 70% of the consumers they surveyed cited convenience as the major reason why they shop for groceries online. Online grocery shopping allows consumers to shop for items from anywhere at any time of day, which is not possible with the in-store channel.

With respect to the statement that groceries are more expensive online than in-store, the probability of shopping online for consumers who disagree is 0.43. Although online grocery markets can provide an easier avenue to compare prices across stores, this may not actually translate to cheaper prices. Degeratu et al. (2000) suggest that consumer price sensitivity in online markets differ from their price sensitivity in traditional stores, which affects consumer purchase behavior. As many retailers have online presence, consumers may find it easier to compare prices of the same products across stores before making their purchase decisions. It is also possible that the online prices of the same products differ from their prices in traditional stores even for the same retailers. However, Cavallo (2017) finds that the price levels of multi-channel retailers are largely similar, but this is heterogeneous across country, retailer level and sector. Nevertheless, the findings of both Degeratu et al. (2000) and Cavallo (2017) indicate the importance of prices and the ability to compare prices easily in both online and traditional grocery stores to consumers.

We also find that the probability of shopping online for consumers who agree that service quality is better online than in-store is 0.42. Similarly, consumers who disagree with the statement are less likely to shop online for groceries, with a probability of 0.21. In an extremely competitive grocery retail sector, service quality appears to be influential to gaining consumer loyalty as well, and this may help retailers gain larger market share (Muhammad et al., 2016). Since there are no

personal interactions between consumers and retailer agents during purchases, the quality of service of online retailers may mainly entail their responsiveness to inquiries, ranging from return/refund, tracking of purchases to payment through multi-channel contact avenues (Jun et al., 2004). Jun et al. (2004) find a significant positive relationship between consumer satisfaction and service quality in online markets, of which online grocery markets is a component.

Although online shopping has been in existence for over two decades, there is still lack of trust among consumers especially for products like groceries (Perea et al., 2004; Keyes, 2019). We capture this issue with the perception statement on food safety. Consumers who agree that food safety is a problem online than in-store are less likely to have shopped for groceries online, with odds of 2.21 and probability of 0.26. Resolving food safety concerns may require significant efforts to allay the fears of those consumers who prefer to see, touch, and feel their groceries before making a purchase.

To summarize how these key demographic and perception drivers influence consumer's decision to shop for groceries online, we present Figure 1, which shows the resulting probabilities from interactions between age and other variables that are significant predictors of online grocery shopping. From all the graphs, a similar pattern emerge. The probability of having previously shopped online for groceries decreases from about 0.4-0.5 for the 18-24 age group to about 0.2 to 0.3 for the 65+ age group. This is an indication that irrespective of the interaction variable, age plays a key role on whether a respondent have previously shopped online for groceries. In other words, younger people, irrespective of their gender, where they live, online shopping experience, having children, and their perceptions about relative prices, convenience, food safety, etc., are more likely to shop online for groceries. These results indicate future opportunities for online retailers to increase their sales in the future, especially as those who are younger now get older.

There are also opportunities to increase the probability of shopping online among young people, as well as the involvement of older people.

Conclusion

Given the projected growth in online grocery shopping and investments in this retail subsector, it is worth knowing what is driving online grocery shopping, especially from the perspective of food consumers, who are the fulcrum of retail transactions. Using data from 985 consumers that are comparable to the United States demographics in terms of age, gender, region and education, we have examined the key drivers of online grocery shopping. Specifically, we tested two broad hypotheses that is a composite of consumer demographics and their perception of online relative to in-store grocery shopping.

Although several consumer demographics were included in the logit model, the key drivers that emerged were age, online shopping experience, and whether the respondent takes children grocery shopping. In terms of perceptions, we found that consumers level of agreement with statements about relative prices, convenience, food safety and service quality were significant predictors of previous online grocery shopping. In general, our work updates and corroborates the studies of Perea et al (2004) and Morganosky and Cude (2000), which were carried out when online grocery shopping initially emerged. However, current projections are optimistic about the future of online grocery shopping. This makes our study valuable to researchers who want to learn how consumer demographics and perceptions are related to their online grocery shopping behavior, to retailers who may want to entice new consumers, and to policymakers who are contemplating whether to introduce online shopping in food security programs.

Despite these potential benefits, our approach rely on observational data. Therefore, our logit estimates are not causal predictors but only associations and descriptions. Our data and analysis provide a basis for future work in this area. Gaining access to rich panel data of consumers from online retailers with possible exogenous variation may be a good place to start for other researchers who may be interested in this area.

References

Blaylock, J. R. (1989). An economic model of grocery shopping frequency. Applied Economics, 21(6):843-852.

Blaylock, J. R. and Smallwood, D. M. (1987). Intrahousehold time allocation: the case of grocery shopping. Journal of Consumer Affairs, 21(2):183-201.

Boyle, M. (2017). Target to buy shipt for $550 million in challenge to amazon. https://www.bloomberg.com/news/articles/2017-12-13/target-to-buy-shipt-for-550-million-in-bet-on-same-day-delivery

Burke, R.R. (2002), "Technology and the customer interface: what consumers want in the physical and virtual store", Journal of the Academy of Marketing Science, Vol. 30 No. 4, pp. 411-32

Cai, J. (2010). The allocation of time and goods: Three essays on American household shopping behavior. PhD Dissertation, University of Michigan.

Carlson, J. A. and Gieseke, R. J. (1983). Price search in a product market. Journal of Consumer Research, 9(4):357-365.

Cavallo, A. (2017). Are online and offline prices similar? evidence from large multichannel retailers. American Economic Review, 107(1):283-303.

Degeratu, A. M., Rangaswamy, A., and Wu, J. (2000). Consumer choice behavior in online and traditional supermarkets: The effects of brand name, price, and other search attributes. International Journal of research in Marketing, 17(1):55-78.

Doti, J. L. and Sharir, S. (1981). Households' grocery shopping behavior in the short-run: Theory and evidence. Economic Inquiry, 19(2):196-208.

Jun, M., Z. Yang, and D. Kim (2004). Customers' Perceptions of Online Retailing Service Quality

and their Satisfaction. International journal of Quality and Reliability Management. 21(8): 817-840.

Keyes, D. (2019). US Online Grocery Adoption is lagging. Business Insider. https://www.businessinsider.com/us-online-grocery-adoption-lagging-2019-2

Kolodinsky, J. (1990). Time as a direct source of utility: The case of price information search for groceries. Journal of Consumer Affairs, 24(1):89-109.

Kolodinsky, J. and LaBrecque, J. (1996). The allocation of time to grocery shopping: a comparison of Canadian and us households. Journal of Family and Economic Issues, 17(3-4):393-408.

Kornum, N. and Bjerre, M. (2005). Grocery E-Commerce: Consumer behaviour and business strategies. Edward Elgar Publishing.

Lancaster, K. L. (1966). A new approach to consumer theory. Journal of political economy, 74(2):132-157.

Li, H., Kuo, C. and Russell, M.G. (1999), The impact of perceived channel utilities, shopping orientations, and demographics on the consumer's online buying behavior, Journal of Computer-Mediated Communication, Vol. 5 No. 2.

Muhammad, N. S., Sujak, H., and Rahman, S. A. (2016). Buying groceries online: The influences of electronic service quality (eservqual) and situational factors. Procedia Economics and Finance, 37:379-385.

Nielsen, N. (2015). The future of grocery: E-commerce, digital technology and changing shopping preferences around the world. Nielsen: An Uncommon Sense of the Consumer, pages 1-35.

Perea y Monsuwe, T., Dellaert, B. G. C., and de Ruyter, J. C. (2004). What Drives Consumers to Shop Online? A Literature Review. International Journal of Service Industry Management, 15(1), 102-121.

Perez, S. (2018). Walmart's sam's club partners with instacart for same-day grocery delivery. https://techcrunch.com/2018/02/27/walmarts-sams-club-partners-with-instacart-for-same-day-grocery-delivery/

Ratchford, B.T., Talukdar, D. and Lee, M.-S. (2001), "A model of consumer choice of the internet as an information source", International Journal of Electronic Commerce, Vol. 5 No. 3, pp. 7-21

Redman, R. (2018). Amazon brings free two-hour delivery to more whole foods stores. https://www.supermarketnews.com/online-retail/amazon-brings-free-two-hour-delivery-more-whole-foods-stores

Thomassen, Øyvind, Howard Smith, Stephan Seiler, and Pasquale Schiraldi. 2017. "Multi-category Competition and Market Power: A Model of Supermarket Pricing." *American Economic Review*, 107 (8): 2308-51.

Train, K. (2009). Discrete choice methods with simulation. Cambridge University Press.

Wang, W., Parker K., and Taylor P. (2013). "Breadwinner Moms." http://www.pewsocialtrends.org/2013/05/29/breadwinner-moms/

Table 1: Demographics of Respondents Segmented by Previously Shopped Groceries Online

Demographics	All Respondents N=985	Previously Shopped Groceries Online N=985	
		Yes (31%)	No (61%)
Gender			
Male	45%	35%	65%
Female	55%	28%	72%
Age (Years)			
18-24	8%	55%	45%
25-34	19%	50%	50%
35-44	17%	41%	59%
45-54	18%	29%	71%
55-64	18%	18%	82%
65+	21%	11%	89%
Income ($)			
0-24,999	24%	28%	72%
25,000-49,999	25%	29%	71%
50,000-74,999	14%	30%	70%
75,000-99,999	15%	42%	58%
100,000+	23%	31%	69%
Education			
Less than High School	3%	24%	76%
High school graduate	28%	29%	71%
Some College, no degree	24%	28%	72%
Associate's degree or Bachelor's degree	32%	33%	67%
Graduate degree or Professional degree	14%	39%	61%
Location*			
Urban	26%	44%	56%
Suburban	50%	26%	74%
Rural	23%	29%	71%
Region			
Northeast	20%	24%	76%
Midwest	36%	35%	64%
South	23%	26%	73%
West	21%	35%	65%
Amazon Prime Subscription			
No	48%	19%	81%
Yes	52%	45%	55%
Takes child/children grocery shopping			
Yes	26%	55%	45%
No	74%	23%	77%

*978 respondents.

Table 2: Perceptions of Respondents regarding Online relative to In-store Grocery Shopping Segmented by Previous Online Grocery Shopping

Perception Statements	All Respondents N=985			Previously Shopped Groceries Online Yes No		
	Agree	Neither Agree nor Disagree	Disagree	Agree	Neither Agree nor Disagree	Disagree
Groceries are more expensive online than in-store	37%	50%	13%	34% 66%	26% 73%	41% 59%
Shopping for groceries is more convenient online than in-store	30%	40%	30%	60% 40%	27% 73%	9% 91%
Shopping for groceries online saves more time than in-store	35%	39%	26%	53% 47%	25% 75%	10% 90%
It is easier to search for grocery items online than in-store	31%	39%	30%	56% 44%	27% 73%	11% 86%
It is easier to compare grocery prices online than in-store	31%	43%	26%	52% 48%	27% 73%	13% 87%
Grocery retailers have a lot more varieties online than in-store	22%	52%	26%	57% 43%	28% 72%	16% 84%
Service quality is better online than in-store	15%	48%	37%	70% 30%	35% 65%	11% 89%
Grocery retailers have more of my favorite brands online than in-store	18%	51%	30%	61% 39%	29% 71%	16% 84%
Shopping for groceries is more fun online than in-store	17%	38%	44%	62% 38%	39% 61%	12% 88%
Online Reviews are more helpful for buying groceries online than in-store	24%	50%	27%	56% 44%	28% 72%	15% 85%
I am more concerned about food safety online than in-store	41%	42%	16%	28% 72%	36% 64%	29% 71%

Table 3: Logit Estimates Predicting Previous Online Grocery Shopping

Variables	Coefficients	Margin
Gender		
Male	0.359 (0.190)*	0.339
Age (Years)		
18-24	1.474 (0.415)***	0.426
25-34	0.846 (0.500)***	0.332
35-44	0.850 (0.356)***	0.333
45-54	0.744 (0.352)***	0.318
55-64	0.390 (0.364)	0.271
Income ($)		
0-24,999	0.131 (0.330)	0.327
25,000-49,999	-0.117 (0.714)	0.295
75,000-99,999	0.230 (0.340)	0.341
100,000+	-0.080 (0.330)	0.300
Education		
High school graduate	0.839 (0.531)	0.293
Some College, no degree	0.643 (0.544)	0.268
Associate's degree or Bachelor's degree	1.347 (0.546)***	0.360
Graduate degree or Professional degree	1.432 (0.593)***	0.372
Location		
Urban	0.534 (0.221)***	0.360
Rural	0.193 (0.236)	0.313
Region		
South	0.006 (0.270)	0.295
Midwest	0.243 (0.289)	0.326
West	0.383 (0.290)	0.345
Amazon Prime Subscription		
Yes	0.879 (0.191)***	0.371
Takes child/children grocery shopping		
Yes	0.855 (0.210)***	0.398
Expensive		
Agree	0.073 (0.217)	0.303
Disagree	1.007 (0.318)***	0.433
Convenient		
Agree	0.728 (0.248)***	0.391
Disagree	-0.335 (0.359)	0.239
Time		
Agree	0.135 (0.248)	0.322
Disagree	0.055 (0.377)	0.311
Search		
Agree	0.439 (0.263)*	0.361
Disagree	-0.322 (0.328)	0.256
Price Comparison		
Agree	0.240 (0.248)	0.327
Disagree	0.247 (0.335)	0.328

Varieties		
Agree	0.400 (0.267)	0.344
Disagree	0.334 (0.339)	0.335
Service Quality		
Agree	0.595 (0.290)***	0.423
Disagree	-0.895 (0.290)***	0.210
Brands		
Agree	0.045 (0.288)	0.317
Disagree	-0.009 (0.309)	0.311
Fun		
Agree	-0.291 (0.283)	0.316
Disagree	-0.810 (0.273)***	0.248
Online reviews		
Agree	0.045 (0.260)	0.307
Disagree	0.481 (0.315)	0.364
Food Safety		
Agree	-0.793 (0.224)***	0.260
Disagree	-0.472 (0.302)	0.299
N	978	978
Pseudo R-square	34%	

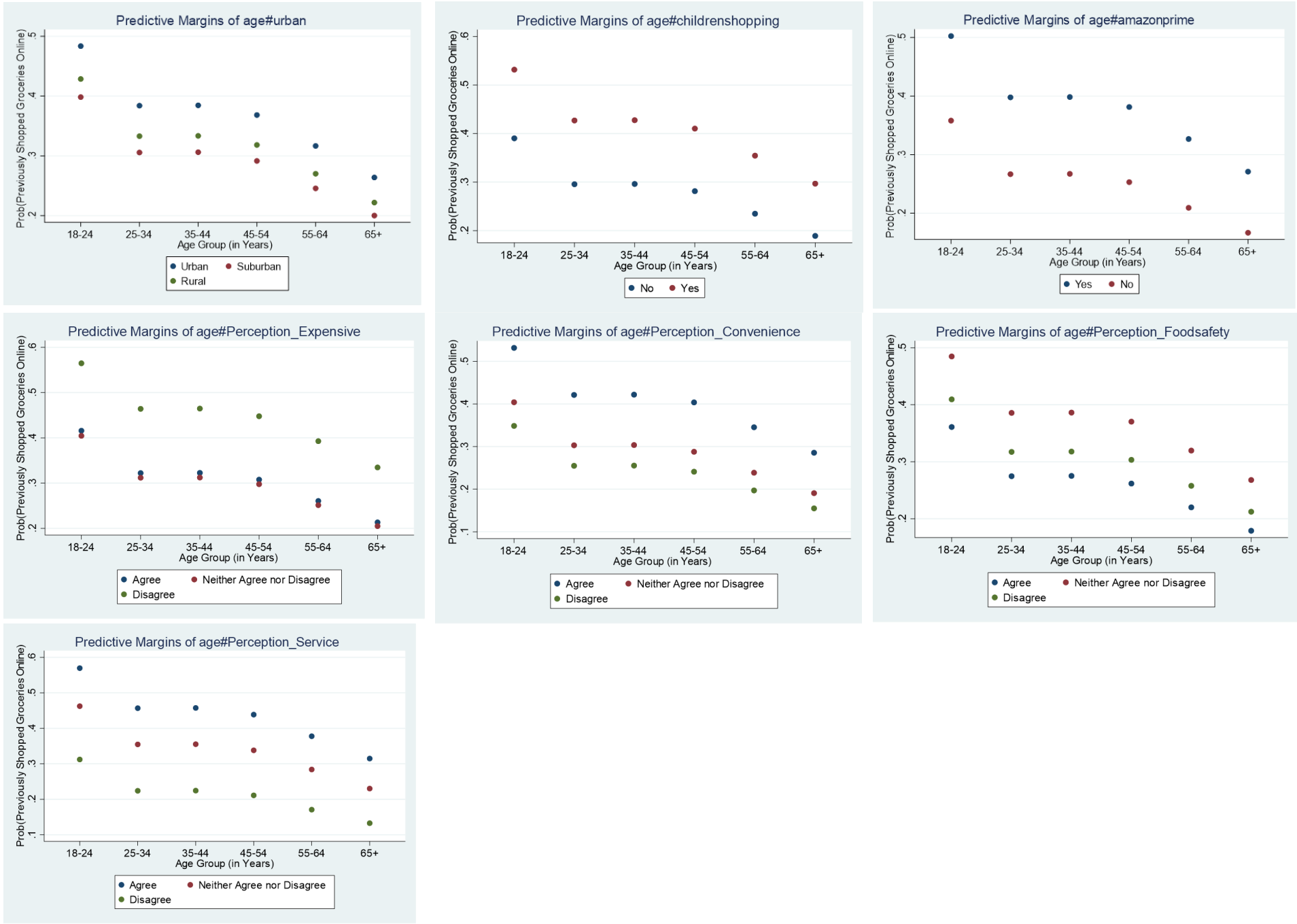

Figure 1: Predictive Margins of Age and other Relevant Variables